“This Publication has been funded by UK aid from the UK Government; however the views expressed does not necessarily reflect the UK Government’s official policies.”

“This Publication has been produced with the assistance of the European Union. The content of this publication does not reflect the views of the European Union.”
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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACF</td>
<td>Action Against Hunger</td>
</tr>
<tr>
<td>FNMD</td>
<td>Facility for New Market Development</td>
</tr>
<tr>
<td>GS</td>
<td>Gaza Strip</td>
</tr>
<tr>
<td>JD</td>
<td>Jordanian Dinar</td>
</tr>
<tr>
<td>NIS</td>
<td>New Israeli Shekel</td>
</tr>
<tr>
<td>MoA</td>
<td>Ministry of Agriculture</td>
</tr>
<tr>
<td>M4P</td>
<td>Making Markets Work for the Poor</td>
</tr>
<tr>
<td>MoH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>NGOs</td>
<td>Non-governmental organizations</td>
</tr>
<tr>
<td>NIS</td>
<td>New Israeli Shekels</td>
</tr>
<tr>
<td>OPT</td>
<td>Occupied Palestinian Territories</td>
</tr>
<tr>
<td>PARC</td>
<td>Palestinian Agricultural Development Association</td>
</tr>
<tr>
<td>PCBS</td>
<td>Palestinian Centre Bureau Statistics</td>
</tr>
<tr>
<td>PMDP</td>
<td>Palestinian Market Development Programme</td>
</tr>
<tr>
<td>PNA</td>
<td>Palestinian National Authority</td>
</tr>
<tr>
<td>UAWC</td>
<td>Union of Agricultural Work Committees</td>
</tr>
<tr>
<td>WB</td>
<td>West Bank</td>
</tr>
</tbody>
</table>
Key Definitions

Weaning

Weaning is a crucial time in the management of ewes and lambs. It is the practice of removing lambs from the milk diet provided by the ewe (or a milk replacement diet) onto forage or grain-based diets. The latter leads to faster growth and higher meat yield. The separation can be stressful for both ewes and lambs if not managed properly. Proper weaning procedures aim to minimise stress and ease the transition.

Abortion

This refers to failed pregnancies, which can be induced by multiple factors, particularly including disease and physical injuries. Often, abortions are facilitated by vets. The abortion rate directly reduces the number of new born lambs.

Colostrum

Colostrum is a type of milk that is produced by ewes during late pregnancy or directly before giving birth. It contains antibodies and a high concentration of proteins and fats, which protects newborn lambs against disease.

Lactation

The period during which new born lambs receive natural milk from ewes for up to 2-3 months. Sometimes this is replaced with alternative milk.

Lamb

Young sheep are generally referred to as lambs.

Mutton

Mutton is the meat from a sheep which is more than one year old. Mutton has a stronger flavor than lamb and is usually comparatively less preferred by consumers.

Yearling mutton

A yearling is a sheep between 1 and 2 years of age.
Executive Summary

This study analyses the market system for weaned lambs in the OPT. It was conducted in collaboration between Development Pioneers and PMDP. The findings are based upon primary research and field stakeholder engagement through questionnaires, focus group discussions, and key informant interviews. Key stakeholders include sheep farmers, traders, livestock input suppliers, academia, and the Ministry of Agriculture (MoA). To validate findings, PMDP also conducted two workshops with a cross-section of these stakeholders.

The livestock sector is one of the most important contributors to the Palestinian economy in terms of value added, livelihoods, and food security. Livestock products (meat and milk) in the oPt were valued at around $445 million in 2008. It involves thousands of low-income livestock farmers, approximately 34,000 livestock households, and millions of consumers of livestock products. Sheep production (along with goats, cattle, and poultry) is one of the main livestock subsectors.

The market system for weaned lambs was selected for deeper assessment following a review of the sheep and goats subsector in the oPt, which highlighted the fact that consumption of lamb meat has been falling due to high prices, and that more than 50% of the contribution to retail meat price is incurred during weaning. Potential increases in efficiency during this process can increase farmer margins, reduce prices, and increase meat output.

Weaning refers to the process of separating newborn lambs from the parent ewes at approximately 60 days of age in the WB and 90 days in the GS. Newborn lambs are switched from their initial milk diet (provided by ewes) to forage or grain based diet. Weaning allows lambs to efficiently convert grain/forage feed to lean tissue (as compared to receiving milk from ewes and converting that to tissue).

The market system consists of livestock (lamb) keepers on the supply side, and traders and consumers on the demand side. Supporting functions constitute of input supplies (i.e. concentrated feed, alternative milk, equipment, information and infrastructure). Rules include local regulations and informal norms. Traders perform a dual function – they both purchase and fatten lambs before on-selling.

Demand for sheep meat is not consistent, and tends to increase during holiday periods (such as Eid Al-Adha). Consumers prefer freshly slaughtered meat, and generally prefer younger animals. According to PCBS statistics from 2011, the total sheep flock size is 732,399 of which 669,843 are in the West Bank and 62,556 in Gaza. The best seasons for selling weaned lambs to traders/fatteners, is 2-4 months ahead of the Haj, Eid Al Adha, and Ramadan (the start of which moves back 10 days each year). Demand for sheep also goes up during the wedding season (over June/July). Traders/fatteners prefer to buy lambs (about 2-3 months old, weighing 20-30 kg) about 2 months ahead, fatten, and sell them off. The key characteristics of demand include:

- Consumption of sheep and goat meat has been falling in favour of beef and poultry. The DFID and World Bank financed Facility for New Market Development (FNMD) report on the sector indicated that per capita poultry consumption almost doubled between 2005
and 2009. Meanwhile, per capita red meat (including beef, sheep, and goats) consumption fell by 15% over the same period.

- Rising prices have been the key driver of the decrease in sheep and goat meat consumption. The current price for fresh sheep and goat meat is NIS 80/kg (WB & Gaza). By comparison, fresh beef costs NIS 40-60 in Gaza and NIS 55/kg in WB, frozen beef costs NIS 23/kg in Gaza and NIS 28/kg in the West Bank, and fresh poultry (chicken) costs NIS 10/kg in Gaza, and NIS 13/kg in WB.

Traders form the main link between farmers and final consumers (though some sales also occur directly through wholesale markets).\(^1\) They perform multiple functions, including purchasing young weaned lambs and goats, feeding and fattening them, and selling them. These functions are not performed exclusively by traders, as some farmers also perform breeding and feeding before selling the lambs either to butchers or directly to consumers. The major traders in the West Bank are Al Junaidi, Al Waha and Modern Harvest Company. While in GS some traders are most known such as Abu Rabie, Abu Khousa, Al Atram, Abu Mashi, Malalha and Al Shaer. Most traders prefer intensive breeding and also have a preference for the Assaf strain (which tends to yield greater meat output and is preferred by customers).

The main production models in OPT are extensive, semi-intensive, and intensive. The sheep population is split roughly 25%/75% between extensive production and intensive /semi-intensive production. The heard is concentrated in Hebron (33%), Jenin (18%), and Nablus (13%).

Production can be organized into small scale, medium-scale, and large-scale farmers. Small herders utilize all three types of production systems and dominate the extensive system, while medium-sized and larger producers use semi-intensive and intensive production.

Following birth, lambs are nursed by mother ewes, initially receiving colostrum followed by natural milk. After this initial period, as the lambs grow, they are gradually switched to a forage/grain based diet (i.e. weaned off milk). Weaning refers to this transition. The advantage of weaning is that it results in an increased growth rate, as lambs are better at converting grain, rather than milk, to meat. The duration of weaning, as well as the timing and type of milk used, are variables which can be adjusted to increase efficiency and resultantly, herder income.

Investigation of weaning norms shows a significant reliance on practices which inhibit competitiveness. This includes the lack of provision of adequate animal housing, hygienic conditions, ventilation and temperature control. Additionally, the vast majority of sheep farmers (95%) are currently utilizing natural lactation, while sheep rearing in countries with more advanced livestock sectors has transitioned to alternative lactation. Maintenance of proper production records is also not common. Furthermore, animal health management has been identified as a key problem area by nearly all stakeholders concerned with developing the sector. It is well established that farmer knowledge of animal health is generally low, and lamb mortality rates are high, between 10-30%. These conditions indicate that the veterinary services market is malfunctioning – a problem which merits further investigation and potentially intervention.

\(^1\) See Figure 15, value chain map.
Key supporting services required for weaning include the provision of sound technical information to farmers, the availability of cost effective equipment, availability of concentrated feed and alternative milk, and veterinary services and vaccine. While inputs including equipment, feed, milk and vaccine are generally available, the particular challenge is convincing farmers of the business case for productivity improvement, and facilitating the sustainable supply of quality technical information to assist the transition to improved practices in lactation and animal health.

The sector overall also suffers from lack of adequate governance. Several of these gaps are discussed in the study; however the key areas where improvements can be made are in exploring new models for the delivery of veterinary services and technical information, regulation of quality standards for input supplies, and control of illegal imports.

The market has significant development impact potential, with approximately 75% of livestock farmers being small and medium scale producers. Additionally, while women only make up 5% of livestock holdings, they provide a significant portion (25%) of (normally unpaid) farm labour, and there are concrete opportunities for them to benefit from increased competitiveness. E.g. through engagement in the management and sale of milk and dairy derivatives.

The study also found that there have been several initiatives to support the livestock sector, primarily financed by international cooperation agencies. The initiatives can be classified by the following three categories: a) technical support through training and raising awareness, b) in-kind support through distribution of sheep and fodder, and c) in research and development. Evidence indicates that a majority of the initiatives have entailed donation of livestock and direct subsidy of farm inputs (particularly to the vulnerable farmers), rather than market-led approaches. Fairly limited attempts have been made specifically to enhance weaning practices.

Weaning practices have not changed significantly over the years; however there are forces at work which will gradually create impetus for increasing productivity to maintain incomes. Key driving forces affecting the system include the rising cost of inputs, declining economic circumstances, a consumer shift to substitutes, and malfunctioning veterinary services.

With a population growth rate of 3%, the demand for lamb meat will continue to rise. There is an opportunity for farmers to take advantage of this through increased productivity and better flock management, which would result in higher margins, growth of the herd, and a decrease in prices for end consumers. The report discusses several pathways to increased competitiveness, including improving farmer practices in breed management, animal housing, lactation, feeding, business management, and on-farm animal health management. The report particularly highlights the opportunity to increase profit margins for farmers by up to 11% (from 22.5% to 33.8%, or NIS 259.5 to NIS 389.5) per weaned lamb by switching from natural to alternative lactation. There are additional opportunities in upgrading veterinary services and in encouraging the public-sector to consider more innovative mechanisms for service delivery.

The report concludes with identification of interventions which have the potential to upgrade competitiveness of lamb weaning in oPt. The challenge for stakeholders concerned with improving the subsector will be to pursue a selection of these in a manner that can result in increases in output and efficiency, albeit sustainably.
Study Objectives

The study analyses the market system for weaned lambs. Its key objectives are to:

1. Develop a clear understanding about the demand for weaned lambs.
2. Understand the supply (production) of weaned lambs in OPT, and identify constraints to increased competitiveness.
3. Analyse supporting functions. i.e. supporting goods and services required by the weaned lambs market system (such as input supplies, information, infrastructure, finance, etc.)
4. Identify and map the weaned lambs value chain and its connection to end markets.
5. Analyse rules and regulations: assess how formal policies (such as those set by the Ministry of Agriculture) and informal norms shape the enabling environment for the system.
6. Assess what role (if at all) low-income individuals and women play in the system.
7. Identify the operations of other donors in the sheep sub-sector
8. Identify the key constraints preventing the market system from moving to a higher level of competitiveness.
9. Map the pathways and potential interventions that can lead to enhanced growth and competitiveness in the market system.

Rationale for Investigating Weaned Lambs

PMDP identified livestock as a high potential sub-sector during its inception phase, after assessing its potential to add to agricultural economy, generate social impact, and how well the sub-sector might lend itself to potential PMDP interventions.

Livestock is the second largest contributor to agricultural output in the OPT after plant production. According to the PCBS, there are a total of 34,000 mixed and pure livestock keepers, holding an approximate total of 732,399 sheep (669,843 West Bank, 62,556 Gaza). The sector contributes about $332 million, the equivalent of 40%, of agricultural GDP, and is a significant source of employment. PCBS’s Livestock Survey 2013 stated that there were 8,628 paid livestock workers during 2012-13, split 75%/25% between the West Bank and Gaza respectively. About 70% of these are temporary workers. Additionally, unpaid workers (farm labour, normally family members), amount to 82,765 workers (83.3% in the West Bank and 16.7% in the Gaza Strip). 80.4% of these are permanent.

While international donors have supported the livestock sector over the years, it continues to perform below its potential. The overall sub sector is well mapped out but detailed information on smaller (but critical) market systems within it (such as weaned lambs), is hard to come by.

PMDP identified such a gap in lamb weaning, and proceeded to conduct deeper analysis of this key function in the sheep value chain. The need for analysis was reinforced by the fact that a large share of the costs of lamb meat ($140 million out of an overall market of $225 million) is tied to the weaning process. Inefficiencies in the system could be contributing significantly to higher sheep meat prices, which have been rising at a significant pace.

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2 This assessment is based upon the market systems approach.
3 See: PMDP Inception Report, 2013
5 EU Agriculture and Livestock Support Programme, 2011
6 It was surprising that greater costs were being accrued during weaning than fattening, the next stage in the process.
Overview: The Sheep Sub-Sector

The PCBS reports that sheep and goat farming represents about 46% of livestock in OPT. PCBS data also shows that 92% of those breeding livestock are men, and 55% of livestock farmers are between 45 – 65 years old. In terms of education, 67% of them have completed school education, 10% of them finished university, while the remaining are illiterate. Over 60% of livestock households (34,000) keep sheep, 30% goat, and about 10% cows.

The total sheep population is significantly higher than goats. However, both populations have declined since 2006.

There are conflicting statistics available about the total population of sheep in Palestine. In this case, PMDP has decided to utilize figures available from the Ministry of Agriculture up until 2013;
figures for 2014 and 15 are estimates, derived from consultations with sector experts. However, it is well established that the sheep heard has been on the decline since 2006/7, due in particular to shrinking grazing lands, high and rising cost of inputs, and high animal mortality.

The estimated value of weaned lambs in the OPT amounts to between $250m (current levels) to $400m (potential). The overall heard is split between males and females, in an approximate ratio of 20%/80%. At this rate, the current derived population of ewes in OPT would be 440,000.

The leading sheep variety in OPT is Awassy (55.7%), which is a local variety, followed by Assaf and other strains (44.3%). Assaf is an imported variety which is popular in Israel. It is known for certain advantages such as higher yield of milk and meat, however, farmers often complain that Assaf sheep are more vulnerable to disease.

**The Core**

**Demand for Weaned Lambs**

Direct demand for weaned lambs comes primarily from traders (see ‘Local Middlemen,’ figure 15), but also from wholesale markets which in turn fall into the rural and urban end markets (i.e. consumers). Therefore the dynamics of both have to be considered.

**Lamb Meat Consumption in OPT**

Demand for sheep meat is not consistent through the year, and tends to increase during holiday periods (such as Eid Al-Adha). Consumers prefer freshly slaughtered meat, and generally prefer younger animals. The volume of sheep and goat meat produced in the West Bank (94% of total meat production) is much higher than Gaza (11% of all meat).  

Demand in the West Bank (see Figure 6) mainly constitutes household consumption, which can be further organized into three main segments:

- **Daily consumption**
- **Religious occasions (such as Eid and Ramadan)**
- **Social events such as weddings and funerals**

In the Gaza Strip, demand for sheep meat is mainly driven by religious occasions since beef is the preferred meat for daily consumption.

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7 A Roadmap for Agribusiness Development in the Occupied Palestinian Territories An analysis of the Vegetables & Herbs, Dairy, and Sheep & Goats subsector, 2011 P.117
The demand for sheep varies directly with the demand for weaned lambs. The requirement for sheep meat goes up during Eid Al-Adha, and the holy month of Ramadan. This in turn increases demand for weaned lambs 4-5 months prior. Therefore planning for sales begins 4-5 months earlier, and traders place their order in advance (order placement depends on trader practices, and most traders will try to purchase weaned lambs 2-3 months ahead of when they want to sell them).

In 2011, FNMD’s assessment of the Sheep and Goats subsector put the estimated domestic demand for sheep and goat meat at 2.5 kg/capita/year. Using this to project current demand would lead to an estimated total of 4,500 MT/year in Gaza and 10,000 MT/year in the West Bank. New estimates from the recently released MoA Livestock Strategy (2015-19), show that consumption of fresh chicken and beef is much higher than consumption of fresh sheep meat in oPt (see Figure 4). Key stakeholders concur with this position. Other key characteristics of demand include:

- Consumption of sheep and goat meat has been falling in favour of beef and poultry. The FNMD report on the sector indicated that per capita poultry consumption almost doubled between 2005 and 2009. Meanwhile, per capita red meat (including beef, sheep, and goats) consumption fell by 15% over the same period (though there was greater decline in sheep meat than beef).
- Rising prices have been the key driver of the decrease in sheep and goat meat consumption. The current price for fresh sheep and goat meat is NIS 80/kg (WB & Gaza). By comparison, fresh beef costs NIS 55/kg in WB, frozen beef costs NIS 23/kg in Gaza and NIS 28/kg in the West Bank, and fresh poultry (chicken) costs NIS 13/kg in WB.
- Imports of sheep and goat meat are considered to be very low. However, anecdotal evidence indicates that this may be on the rise, with smuggled sheep being brought into the country.
According to farmers, the best seasons for selling lambs and sheep are during Al Hajj, Al-Adha Eid, and during Ramadan (which moves backward by 10 days each year). Traders prefer lambs that are about 3 months old; they then fatten the lambs for 2-3 months, before selling them at about 6 months old. Some traders buy older lambs (more than 3 months), and keep them only a month or so before final sale. Traders try to time procurement 2-3 months before special/religious occasions, so as to have enough time for fattening and slaughtering. Farmers state that customers prefer healthy lambs of weight between 40-60 kg. Assaf is a preferred breed. Farmers strive to match the demand for 3 month old lambs, and very few sell lambs younger than that. A considerable number of farmers stated that their preference is to sell lambs/sheep, rather than breeding them to become mother ewes. Sales prices depend upon age and weight. See Table (2).

Table (1) Sales prices for live lambs

<table>
<thead>
<tr>
<th>Stage</th>
<th>Gaza Strip Sales Prices (Average)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>JD</td>
</tr>
<tr>
<td>Average price/kg</td>
<td>5.5</td>
</tr>
<tr>
<td>New born lamb (7 days old)</td>
<td>85 (80-90)</td>
</tr>
<tr>
<td>At 90 days (Weaned Lamb)</td>
<td>200 (180-220)</td>
</tr>
<tr>
<td>At 180 days (Fattened Lamb)</td>
<td>275 (250-300)</td>
</tr>
<tr>
<td>More than 180 days</td>
<td>275+</td>
</tr>
</tbody>
</table>

These prices are tentative as Gaza farmers used to sell lambs after weaning not earlier.
These prices are tentative as Gazan farmers used to sell lambs after weaning not earlier.
* Until 90 days of age, prices are set for the lamb as a whole. After 90 days, the lamb price is determined based upon its weight.
* The above prices are estimates, obtained during the study’s information collection period (August-September 2015).

Table (1) Sales prices for live lambs

<table>
<thead>
<tr>
<th>Stage</th>
<th>West Bank Sales Prices (Average)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>JD</td>
<td>NIS</td>
</tr>
<tr>
<td>Average sales price/kg</td>
<td>5.5</td>
<td>30</td>
</tr>
<tr>
<td>New born lamb⁹ (7 days old)</td>
<td>75 (70-80)</td>
<td>412 (440-495)</td>
</tr>
<tr>
<td>At 60 days (Weaned Lamb)</td>
<td>210 (200-220)</td>
<td>1155 (1100-1210)</td>
</tr>
<tr>
<td>At 180 days (Fattened Lamb)</td>
<td>350 (300-400)</td>
<td>1925 (1650-2200)</td>
</tr>
<tr>
<td>More than 6 months</td>
<td>350+</td>
<td>1925+</td>
</tr>
</tbody>
</table>

Consumers prefer male lambs to female lambs. However, when there is a shortage of male lambs in the market, then it is common for female lambs to be purchased and slaughtered.

⁹These prices are tentative as Gaza farmers used to sell lambs after weaning not earlier.
Lamb Traders

Traders perform a dual function, as they both fatten and sell lambs.10

Traders form the main link between farmers and final consumers (though some sales also occur directly through wholesale markets).11 They perform multiple functions, including purchasing young weaned lambs and goats, feeding and fattening them, and selling them. These functions are not performed exclusively by traders, as some farmers also perform breeding and feeding before selling the lambs either to butcheries or directly to consumers. The major traders in the West Bank are Al Junaidi, Al Waha and Modern Harvest Company. While in GS some traders are most known such as Abu Rabie, Abu Khousa, Al Atram, Abu Mashi, Malalha and Al Shaer.

Most traders prefer intensive breeding and also have a preference for the Assaf strain (which tends to yield greater meat output and is preferred by customers). Most traders will feed the lambs for about 2-3 months before selling them onwards.

Larger traders on-sell to wholesale markets, and smaller traders cater to rural markets (and in Gaza’s case, refugee camps). From these markets, fattened lambs are taken to butcheries, and then final consumers. In Gaza, a few traders have also been selling live lambs to NGOs, which then donate these to small-scale farmers as part of livestock support projects. During the study, the majority of traders said that they prefer to maintain lamb weight between 40-60 kg as customers prefer to buy lambs within this weight range. Breed, price, and weight are the key factors that traders consider when purchasing live lambs.

In the Gaza Strip, the average weight/age combination for weaned lambs is 25kg at 3 months (90 days). In the West Bank, it is 19kg at 2 months (60 days). Most traders purchase locally raised lambs, while a few of them occasionally import live sheep (the Ministry of Agriculture issues permits on occasion) (Israel as well as other countries). There is some smuggling of sheep taking place, and anecdotal reports indicate this is on the rise. The typical price for a weaned lamb is about 210 JD (NIS 1,155) in the West Bank, and 200 JD (NIS 1100) in Gaza.

Prices fluctuate with the season and occasion. In the West Bank, prices generally go down in Jan, Feb, and March (5.5 JD/kg). In April, May, June, the price is 6 JD/kg. Prices increase from June-Oct, going up to 6.5JD/kg, before coming back down again towards the end of the year. In the West Bank, the average selling price for lambs weighting 60 kg is 350 JD.

---

10 These are discussed together in the narrative, but shown separately in the value chain map.

11 See Figure 15, value chain map.
Market System Analysis: Weaned Lambs

Figure (5): Estimated distribution of annual demand
Source: PMDP field research.

Figure (6): Lamb sales price distribution (JD/Kg)

Supply: Production of Weaned Lambs

Weaned Lambs are produced by ordinary sheep herders. Presently, approximately 85% of herders practice some form of weaning. The remainders sell their lambs soon after birth, to traders. Analysis done by FNMD in 2011 showed that small herders account for most of the sheep population, and in 2011, there were known to be 76 cooperatives operating in livestock, most of them engaged in raising sheep and goats.12 Small herds are normally managed by family

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12 A Roadmap for Agribusiness Development in the Occupied Palestinian Territories An analysis of the Vegetables & Herbs, Dairy, and Sheep & Goats subsector, 2011
members, including women and children. It is estimated that only 32% of herders are full-time farmers, with the rest also engaged in other full or part-time occupations.

![Herd Size Distribution for OPT Sheep and Goats Households (31,068)](chart)

**Figure (7): Herd distribution for sheep and goats households, oPt**
Source: FNMD study 2011.

Production can be organized into small scale, medium-scale, and large-scale farmers. Three basic production models are found in the country — extensive, semi-intensive, and intensive. These are distinguished from each other in the use of inputs such as animal feed (semi-intensive and intensive) as opposed to natural grazing (extensive). Extensive production has been declining due to reduction in the availability of grazing land and water. The sheep population is split roughly 25%/75% between extensive production and intensive /semi-intensive production. Small herders utilize all three production systems and dominate the extensive system, while medium-sized and larger producers use semi-intensive and intensive production. A detailed breakdown of production models and accompanying farmer characteristics can be found in Annex 5.

Geographically, the sheep heard is concentrated in Hebron (33%), Jenin (18%), and Nablus (13%). However, there is not a wide consensus on this, and some producers claim that there the sheep heard in the north is larger.

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13 Ibid.
Farmers manage the primary practices of weaning, including nursing, feeding, farming/breeding, and vaccination. Artificial insemination is not widely practiced.

The annual production of Weaned Lambs can be estimated from the total current ewe population (95% of which is located in the West Bank). From a current estimated ewe population of 440,000, and estimated 601,392 weaned lambs should be produced during the year. PMDP’s estimates are shown in the table below, and take the abortion and mortality into account.

<table>
<thead>
<tr>
<th>Estimated Annual Production of Weaned Lambs in oPt.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A Ewe Population</td>
<td>440000</td>
</tr>
<tr>
<td>B No. of Times Birth is Given Each Year</td>
<td>1.5</td>
</tr>
<tr>
<td>C Twins rate</td>
<td>1.34</td>
</tr>
<tr>
<td>D Newborn Lambs (AxBxC)</td>
<td>884,400</td>
</tr>
<tr>
<td>E Aborted Births (15% of D)</td>
<td>132,660</td>
</tr>
<tr>
<td>F Net newborn lambs (D-E)</td>
<td>751,740</td>
</tr>
<tr>
<td>G Mortality (20% of F)</td>
<td>150,348</td>
</tr>
<tr>
<td>H Net lambs (for weaning) (F-G)</td>
<td>601,392</td>
</tr>
</tbody>
</table>

Table 2: Estimated Annual Production of Weaned Lambs in the oPt

Source: PMDP Analysis
Net lambs produced are distributed approximately 50%/50% between males and females. Males are preferred for slaughter and consumption. However, when there is a shortage of males, females are slaughtered. With the declining herd, there may be the danger that excess reduction of females would compound the reduction of the total heard.

Raising and Weaning

Following birth, lambs are nursed by mother ewes, initially receiving colostrum followed by natural milk (see: Lactation Practices). After this initial period, as the lambs grow, they are gradually switched to a forage/grain based diet (i.e. weaned off milk). Weaning refers to this transition. The advantage of weaning is that it results in an increased growth rate, as lambs are better at converting grain, rather than milk, to meat. In the West Bank, weaning is typically begun at 7-10 days following birth, and is completed at about 40-60 days, by which time the lambs are entirely on a grain-based diet. In Gaza, the process takes longer, beginning at the same age, but lasting until lambs are 90-100 days old.

The duration of weaning, as well as the timing and type of milk used, are variables in the process. They can be adjusted to increase efficiency and resultantly, herder income, as further analysis will show.

Lactation Practices

Discussions with farmers and livestock stakeholders indicate that 95% of farmers utilize natural lactation, and approximately 5% utilize alternative lactation. Most farmers believe that natural lactation is nutritionally better for lambs. This is indeed true for colostrum, which is a special milk produced by ewes for 1-2 days upon giving birth. Research shows that it is essential for newborn lambs to receive colostrum for at least 24 hours after birth due to its multiple benefits – facilitating digestion and protection against several diseases (e.g. watery mouth, coccidiosis, clostridia diseases and pastuerellosis). Under a natural lactation process, the stages of lamb growth and be represented as done so in the following table:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Birth</th>
<th>Growth</th>
<th>Weaning (Start)</th>
<th>Weaning</th>
<th>Weaning</th>
<th>Weaning (End, WB)</th>
<th>Weaning (End, G)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of lamb (days)</td>
<td>0-10</td>
<td>10-20</td>
<td>20-30</td>
<td>30-40</td>
<td>40-50</td>
<td>50-60</td>
<td>60-100</td>
</tr>
<tr>
<td>Natural Milk (litres/day)</td>
<td>0.5</td>
<td>0.8</td>
<td>0.9</td>
<td>1.1</td>
<td>1.2</td>
<td>1.4</td>
<td>1.1</td>
</tr>
<tr>
<td>Concentrated feed (kg/day)</td>
<td>0</td>
<td>0</td>
<td>0.1</td>
<td>0.3</td>
<td>0.5</td>
<td>0.6</td>
<td>0.8</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>3 to 6</td>
<td>6 to 9</td>
<td>9 to 12</td>
<td>12 to 14</td>
<td>14 to 16</td>
<td>16-18</td>
<td>18-21</td>
</tr>
</tbody>
</table>

Table 3: Stages of lamb growth using natural lactation. Source: PMDP Analysis

Following the first few days of colostrum consumption however, there is an alternative to natural milk, which is to switch to artificial milk. This is a common efficiency-increasing practice in other countries, including Israel. Under the practice, post-colostrum stage, lambs are quickly switched to alternative milk. Meanwhile, ewes continue to produce milk, which can then be sold separately or converted into milk product (such as cheese). The primary advantage of utilizing alternative lactation is that it reduces the overall cost of weaning, as:
• It increases efficiency and shortens the weaning period/production cycle
• Natural milk from ewe can be sold separately for additional income
• It reduces the risk of disease transfer from ewes to lambs, and reduces the risk of mastitis.

The stages of lamb growth under alternative lactation model are showcased in the table below:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Birth</th>
<th>Growth/Weaning (Start)</th>
<th>Weaning</th>
<th>Weaning (End)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of lamb (days)</td>
<td>1-7</td>
<td>7-20</td>
<td>20-30</td>
<td>30-40</td>
</tr>
<tr>
<td>Alternative Milk (litres/day)</td>
<td>0.6</td>
<td>1</td>
<td>1.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Concentrated feed (kg/day)</td>
<td>0</td>
<td>0.2</td>
<td>0.35</td>
<td>0.5</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>3 to 6</td>
<td>6 to 10</td>
<td>10 to 14</td>
<td>14 to 18</td>
</tr>
</tbody>
</table>

Table 4: Model for stages of lamb growth under alternative lactation. Source: PMDP Analysis.

However, for the process to be executed successfully, significant know-how and certain equipment is required. Alternative milk can be bought at local markets in OPT, often at veterinary pharmacies. Only two brands are available in the market, an Israeli brand and a Dutch brand. No significant preference between the two is found.

Amongst the small number of farmers who are practicing alternative lactation, mixed practices were found, indicating that farmers are not well informed about milk mixing. In Gaza, some farmers reported using the same milk consumed by humans to feed lambs. Commonly, 0.5 kg or 1 kg of dry alternative milk is diluted with 3-4 liters of water before feeding. Instructions are listed on the cartons, but routinely ignored as farmers want to stretch out the quantity of milk. 80% of farmers interviewed in this study reported learning about milk mixing from their forefathers, or by experimentation. Only 20% stated that they followed the instructions on the cartons, or those given by vets.

Financial analysis done by PMDP shows that alternative lactation can reduce costs and increase profit margins for farmers. Analysis shows that in the West Bank, the average cost of weaning (using natural lactation) is about NIS 450/lamb. At an average sales price of NIS 1150/lamb, the resulting profit is NIS 287/lamb. Using alternative milk can increase this profit by reducing the cost of lactation, as well as by creating an additional revenue stream through the sale of natural milk and milk derivatives (cheese, labneh, etc.). For the gain to be realized, the resulting natural milk saved has to be sold separately (at current prices of NIS 5/liter in WB and NIS 2.5 in Gaza). Under the model, alternative milk use drops total weaning cost by about 15% to about 320 NIS per lamb, leading to an increased estimated profit of NIS 417.

The following chart compares the financial impact of the two models of lactation. The analysis assumes a weight of 18kg at completion of weaning, which is assumed to be 60 days under natural lactation, and 30-40 days under alternative lactation.
In Gaza the average cost of weaning (using natural milk) is about NIS 347/lamb, and the corresponding sales revenue is NIS 1100/lamb at a profit margin of NIS 286. Using alternative milk, the average total cost of weaning is about NIS 250/lamb (about 33% less). Profit margins are correspondingly higher, at NIS 383/lamb.

Most Gazan farmers that were interviewed refused to consider the possibility of using alternative milk. However, farmers in the West Bank were more open to the idea, and showed interest, provided that the alternative milk was of good quality, and they could obtain the know-how about how to purchase and utilize the right milk and equipment. A key reason behind this could be the fact that farmers do not price in the cost of using natural milk into the cost of goods sold.
The study found that mortality amongst new born lambs is very high; averaging 20% per annum, and rising to as high as 35% during winter. This results in a loss of approximately USD 19.9m/yr. to the sub-sector (at an average sales price of 95 JD/lamb).

On-farm Practices

Farmers tend to over rely on traditional practices to raise lambs. This includes activities such as keeping ewes and new-born lambs in the same area, which can lead to higher disease and infection rates. Other issues include:

- Farmers under the extensive model, have a practice of letting new-born lambs go unfed for long periods during the day while ewes are grazing. A consequence of this is that upon return to sheds, ewes overfeed newborn lambs, which can cause diarrhea and other illnesses.
- Not providing adequate ventilation and temperature control during breeding.
- Records are not kept regularly
- Sheds and barns are not fumigated regularly (to prevent disease)

Animal Health Management

Animal health management has been identified as a key problem area by nearly all stakeholders concerned with developing the sector. Two facts are established:

- Farmer knowledge of animal health is generally low
- Mortality rates are high, reported at 10-30% of new born lambs

While various programmes have tried to address this issue, it is unclear whether interventions have been market-based, and interviews conducted during this study generally indicate otherwise. The potential for market based solutions for improved animal health merits further exploration.

Self-administration of medicine is common, and farmers normally obtain medicine/vaccines from private pharmacies. Despite self-administered care, each of the small scale farmers interviewed during this study reported losing around 3-6 lambs and 2-5 goats die per year. During focus group discussions, farmers reported average mortality rates at 20% in the West Bank and 30% in Gaza.
Most farmers (estimated 60%) confirmed that lamb deaths occur right after birth, between 1-10 days of age. Lambs continue to remain vulnerable until the age of 6 months. Very hot or cold weather can also increase mortality, as most farms lack effective sheep housing and necessary equipment for intensive breeding.\textsuperscript{14} Another major health issue is mastitis amongst ewes, which reduces milk production to little or none. Diet adjustments can prevent mastitis. Veterinary services in the country are recognized to be poor.

The MoA provides the bulk of these, however farmers complain that quality and regularity is unreliable. The chart below illustrates the estimated effect of mortality on annual lamb production in oPt (the model uses estimated production for 2015-16). Total losses (from abortions and newborn lamb mortality) amount to over 35% of net lambs produced. There is a strong need for reducing mortality rates.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure10.png}
\caption{Figure (10): Causes of sheep mortality}
\textit{Source: PCBS Livestock Survey 2013}
\end{figure}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{figure11.png}
\caption{Figure (11): Expected production of net weaned lambs, 2015-2016}
\textit{Source: PMDP Analysis.}
\end{figure}

\textsuperscript{14} PMDP validation workshop.
Animal Housing and Infrastructure

Newborn lambs require a healthy physical environment and appropriate infrastructure. The lack of this, plus unhygienic conditions, facilitates the spread of disease. Most livestock farms, particularly smaller ones use cheap and simple materials for structures such as holding pens for sleeping and feeding. In urban areas, farmer infrastructure is known to be somewhat better than rural areas.

Ideally, there should be dedicated housing areas for mother ewes, newborn lambs, weaned lambs, and fully-fattened lambs. Shelter should also take into consideration ventilation, temperature control, and hygiene. These are particularly important for newborn lambs, which are more susceptible to the elements. Small-scale farmers in particular do not devote enough attention to housing – small investments in housing could reduce mortality rates amongst their flock, as well as reduce the costs of medicine.
Figure (12): Value Chain of Weaned Lambs
Source: FNMD Study, 2011
Supporting Services

Technical Information and Research
Both farmers and traders lack sufficient knowledge about best practices in weaning, and are not aware that these could result in increasing their profitability. Their knowledge of disease management is also limited, and resultant mortality rates are high. Unfortunately, neither the public sector nor private sector has thus far succeeded in upgrading practices for a significant proportion of actors in the sector.

The Palestinian Authority has a limited budget to support agricultural development, and livestock extension services are known to be in poor shape. There are no known mechanisms specifically to support improved weaning practices. For example, the MoH does not conduct regular medical tests for sheep health. As a result, when infections take place, infected animals are often put to rest. Therefore, the public sector plays a limited role in the provision of technical assistance due to lack of funds, coordination, capacities and technical skills. Private vets fill this gap to an extent, but they are located mainly in urban areas, and their prices are out of the reach of most small-holders.

Livestock research in the public sector is done mainly by the MoA’s Palestinian National Centre of Agricultural Research (PNCAR). Additionally, there are three universities with faculties of agriculture – Al-Najah University, Hebron University, and Al Azhar University. Their collective impact is difficult to judge. However the type of husbandry and feeding practices being followed in the sector indicate much room for improvement.

Equipment/Infrastructure

Both farmers and traders have generally poor infrastructure for lambs’ breeding and weaning. Places where sheep give birth are not well equipped or prepared for safe delivery in terms of hygiene. The major equipment required for weaning, along with indicative prices, includes:

| Item                              | Price        | Source                      |
|-----------------------------------|--------------|                            |
| Lactation machine                 | NIS 5,000-20,000 | Imported                   |
| Lactation containers              | NIS 50       | Imported                    |
| Boiler                            | NIS 600      | Imported/some local manufacture |
| Mixer                             | NIS 200      | Imported/some local manufacture |
| Small electricity generator       | NIS 1000     | Imported                    |
| Heater                            | NIS 300-1000 | Imported and local          |
| Smaller tools for cleaning/maintenance | NIS 500   | Imported                    |

Table 5 List of equipment and prices. Source: PMDP research.
Farmers generally don’t have appropriate tools to assist reproduction and feeding, and for many farmers, the above equipment would be too expensive. However, equipment upgrading is also held back by farmer attitudes, business acumen, and a tendency to resist upgrades which may increase maintenance burden. However there are several types of equipment available, and there are low-cost option which are suitable for smaller farmers too.

The United Company and the Modern Harvest Company are the major equipment distributors in the oPt. Local equipment manufacture is very limited.

**Input Supplies**

The major inputs required are:

**Feed**

Feed takes up the largest share of the cost of production, at up to 70%. It consists of concentrated feed (including salt and vitamins) (mostly imported from Israel, though there is significant local production), grains (wheat bran, corn, barley, soya beans), roughage (including hay).

**Milk**

There are two main sources of milk – natural fresh milk and alternative milk. Natural fresh milk is supplied by ewes for the duration of the weaning period. Alternative milk can be purchased from agro-input dealers. There are two brands available in the market, an Israeli and a Dutch brand. The Israeli brand comes pre-mixed with certain medicines.

United Company was found to be the largest supplier of inputs in OPT, selling alternative milk, vaccines, livestock equipment and vets supplies.

**Vaccines and Medicines**

The vast majority of vaccines are imported from Israel. These are sold by local companies and retailers. Farmers normally have to pay for the vaccines, though in some cases vaccines have been subsidized by donors. The MoA distributes FMD and Brucellosis vaccine free. The major local producers are Farmacare, and the Palestinian Company for Veterinary Pharmaceuticals.

**Veterinary Services**

Most vet services are provided by public vets. However the system is hampered by insufficient and inadequately trained staff, and lack of financial resources. There are about 55 public vets (26 permanent, 29 contracted) in the OPT. However about half are estimated to be operating in an administrative rather than field capacity. These are supplemented by approximately 50 poorly-trained assistants. According to MoA statistics, there are also another 152 registered private vets in the OPT.

Farmers often allege that vets are little more than salesmen, and vets claim that farmers make poor choices and are unaware of best practices. Vets also complain that rather than acting proactively, farmers call on them as a last resort. Vet clinics are mostly single-person establishments, known by the name of the vet. Some examples in the WB are Abu Younis Center,
Almasri Clinic, the United Company, and Alwafa Vets Center.

Financial Services

Farmers and traders usually depend on their own financial sources. Some small scale farmers are receiving assistance from international organisations, in the form of fodder, medicines, vaccines, and lambs. The reach of such assistance is limited. Accessing commercial finance is not easy; most farmers don’t have experience in doing so, and in any case are averse to taking on formal debt.

Slaughterhouses

There are eight known slaughterhouses in the West Bank, and five in Gaza. Consumers prefer purchasing meat from butcheries rather than slaughterhouses, primarily because they are surer of hygiene and quality standards at the former. Slaughterhouses also do not have the capacity to serve more than approximately 10% of the requirement.

Rules

Formal Policies and Laws

For farmers to be registered, they have to follow up with various authorities, including the Ministry of National Economy, Ministry of Agriculture, Ministry of Health, and the Environment Quality Authority. Because the procedures are complicated and benefits unclear, most farmers choose not to register. Legal protection for animals is very limited. An Animal Protection Act was passed in 1998. It emphasizes the proper breeding and treatment of animals, and focuses on the following:

- Disease control: this law emphasizes the roles of the Ministry of Agriculture and Ministry of Local Governance in animal health and vaccination. It is known that MoA also controls the supply of certain vaccines, especially those related to epidemic outbreaks. It makes farmers responsible for ensuring adequate farm management.
- Establishes protocols for monitoring farms for infestations/overcrowding, and taking actions if required.
- List penalties for those who breach animal protection laws.

The Act is neither implemented by farmers nor enforced by the government. There is likely very limited awareness of its existence. A lack of effective government support in the form of technical assistance and extension services contributes to continued low productivity levels amongst farmers.
Informal Norms

Informal norms are the main mechanism through which farmers pick up management practices. The table highlights important informal norms observed in the system:

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most farmers prefer natural feeding for lambs; it is believed that alternative feeds lack adequate nutrients.</td>
<td>Increases production cost</td>
</tr>
<tr>
<td></td>
<td>Exposes the lambs to diseases transmitted from the mother (when it gets sick).</td>
</tr>
<tr>
<td>If mother’s milk is not sufficient for new-born lambs, farmers tend to use milk from other ewes or cow’s milk</td>
<td>Can lead to disease transfer and reduced immunity.</td>
</tr>
<tr>
<td>Weaning period ranges between 40-60 days in WB, and 90-100 days in Gaza.</td>
<td>The long period adds to farmer costs, and causes delays.</td>
</tr>
<tr>
<td>The lambs are not weaned gradually</td>
<td>Sudden isolation from ewes causes problems for lambs, including stress.</td>
</tr>
<tr>
<td>Knowledge of vaccination amongst farmers is limited and these are often administered inadequately.</td>
<td>Increases disease incidence and animal mortality.</td>
</tr>
</tbody>
</table>

Low-income Groups in the Market System

The primary low-income group in this market system is small-scale farmers. According to a PCBS analysis in 2012, small scale farmers represent approximately 75% of 34,000 livestock farmers in the OPT. This indicates there may be approximately 22,400 small scale farmers living at or lose to the poverty line, with monthly incomes not exceeding $200.

Labourers are a second important low-income group in the system. The majority of herders have only a single labourer, while traders can employ 2-3 labourers. These are often family members lending a helping hand. Occasionally, paid labourers are brought in part-time to handle the extra workload during high season. Family labour is preferred, as family members don’t have to be paid.
Women in the Market System

Women constitute only 5% of the total number of livestock owners (as per PCBS 2013), and provide roughly 25% of labour. Women and children are typically quite involved in livestock care (particularly in smaller operations) in the functions of feeding, animal care, and cleaning.

They are also often involved in husbandry and care for new-born lambs. However, the sector is a male-dominated one, and there are barriers to increased access and income for women. Women have limited control over household assets and capital, and typically do not directly handle receipts from livestock sales. Their participation in decision making, particularly regarding feeding, processing, or marketing of dairy products, is also limited.

Programmes Supporting the Livestock Sector

Historically, three types of support have been provided to the sector: a) at the technical level through training and raising awareness, b) in-kind through distribution of sheep and fodder, and c) in research and development.

The majority of support has been in-kind support from agencies such as FAO, EU, Oxfam, ACF, UNDP, Islamic Development Bank, Care International, Diakonia, Welfare Association and Qatar Charity. These agencies have worked through a host of local NGOs such as the Agricultural Development Association (PARC), Maan Development Center, and the Union of Agricultural Work Committees (UAWC).

A few projects have also extended technical support to the subsector, for instance Diakonia supported livestock farmers to improve their management systems through a project implemented by PARC. At present, there are no known projects approaching the weaning process from a sustainable, market-led lens.
The Forces Driving Change

The forces which have been driving change in the market system in recent years include overall economic conditions, government support, input costs, market shifts, and consumer preferences.

Declining Economic Circumstances

The consumption of sheep meat varies directly with price and purchasing power. In the last few years, the economic circumstances in Gaza have been very poor, and rising poverty means that demand for expensive meats such as lamb has fallen, in favor of other meats. In the West Bank too, growth has slowed down and the economy contracted last year. In Gaza the current price of lamb meat is 70 NIS/kg, while that for chicken meat is 7-9 NIS/kg.

Rising Cost of Inputs

The price of meat and dairy products varies closely with the cost of feed consumed by livestock. In oPt, feed cost has been rising steadily and has almost doubled in the last ten years. Prices often fluctuate, and at times the same feed is sold at different prices between the West Bank and Gaza.

Malfunctioning Veterinary Services

It is evident that the private veterinary services market does not work well, and there is a dearth of trust between farmers and private vets. This is leading to large flock losses, reportedly
between 10-30% per annum. Levels of technical knowledge amongst small farmers are low, and animal health commonly suffers for it.

**Collusive Behavior amongst Traders**

In particular during seasons of high demand such as Eid Al Adha, collusion amongst traders is witnessed, as they try to set high prices and take advantage of high demand. This is particularly evidence in Gaza, where there are about 4-5 large traders.

**Consumers are Shifting to Substitutes**

While consumers have a strong liking for lamb meat, and particularly the Assaf variety, high prices are pushing them to consume alternatives. This can be seen in a comparison of current consumption of sheep meat versus beef and chicken meat. In particular, chicken meat consumption has seen a very significant increase in the last 5-8 years.

**Free distribution of lambs by INGOs in Gaza**

The free distribution of livestock in Gaza is a common practice amongst development agencies pursuing livelihoods strategies. It is unclear what impact this is having on overall market economics, however, higher than average mortality rates have been witnessed amongst those receiving the lambs, as they often do not know how to care for them.

**Limited Knowledge Leading to Low Competitiveness**

Small-scale farmers are not in tune with best practices pertaining to lamb breeding, weaning, and fattening. They are not regularly exposed to new sources of information, and as a result, often continue to practice behaviors which are inimical to their flock. For example, this includes avoiding the provision of a proper physical environment for lambs, and skipping vaccine administration. When made aware of best practices, farmers do show a willingness to adopt new behaviors. The use of cooperatives and lead firms in the system could provide a mechanism for relaying such technical knowledge to farmers.
## Systemic Constraints

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Symptoms</th>
<th>Root Causes</th>
</tr>
</thead>
</table>
| **Low competitiveness and high production costs (parent farms management)** | • Yield are below potential  
• Poor production planning  
• Regular tests and veterinary follow up not conducted  
• High mortality amongst new-born lambs  
• High abortion rates up to 15% | • Poor farm management driven by low technical/managerial knowledge  
• Farmers prefer traditional farming practices  
• Poor extension services  
• Domestic livestock rearing research is weak. Foreign research is not proactively channeled in.  
• Regular border closures increase input costs, especially fodder. |
| **Poor animal health management** | • Lambs are often weaned late  
• Vaccines are often not administered on time, or skipped altogether  
• Common for ewes to get sick and transfer illness to lambs | • Lack of technical knowledge, particularly related to animal health management  
• Feeding practices are also not modern  
• Work on improving sheep strains is not being done. |
| **Poor infrastructure during weaning** | • Most barns and sheds, where lambs are kept, lack basic requirements. Not well ventilated, or lighted; no appropriate sewage systems; lack of tools and equipment necessary for breeding.  
• Increased infection and disease  
• Low yields | • Limited financial capacities and few avenues for equipment financing  
• Lack of knowledge of equipment and input management requirements amongst farmers  
• Lack of specialized centers for distribution and maintenance of certain equipment, such as lactating machines. |
| **Policy environment doesn't induce quality** | • Low trust between farmers and public service providers  
• No regular medical tests conducted by any governmental agency  
• Insufficient monitoring of imported sheep  
• Poor public veterinary system | • Poor coordination among private & public actors in the supporting services  
• No regulations or laws controlling farming, raising, breeding lambs, or animal production in Gaza Strip. There is no supervision.  
• Weak governmental coordination, as well as limited interventions to regulate imports. |
| **Market Shifts** | • Retailers are able to step in and out of markets, sometimes manipulating farmers | • Poor planning/lack of agility amongst farmers |
Market System Analysis: Weaned Lambs

Informal rules & norms:
- The belief in the natural milk as the most beneficial to the lambs
- Strong preference for traditional weaning practices

Other related services:
- Private market for vet services is not performing
- The costs of feed are high and rising

Infrastructure:
- Poor infrastructure of barns owned by farmers.
- Places where sheep give birth are not well equipped, nor well prepared for safe delivery; they are not clean, lacking facilitation.
- Farmers do not have the necessary, appropriate tools for reproducing and feeding
- Lack of maintenance service providers for automated lactating

Information:
- Limited research on farmer practices and sheep varieties. Limited local livestock research capacity.
- Limited sources of information about good weaning practices
- Farmers are not aware of diseases that might affect weaned lambs. To handle such diseases, they seek help from experienced farmers, but they do not rely on science.
- Lack of market information
- Lack of knowledge about breeding practices

Infrastructure / Equipment:
- Related services
  - Informing & communicating
  - Setting & enforcing

Informal rules & norms:
- Quality standards neither monitored nor enforced
- No certain standards of technical regulations for the weaned lambs and no lamb farms with GAAP certificate in the oPt

Information:
- Limited research on farmer practices and sheep varieties. Limited local livestock research capacity.
- Limited sources of information about good weaning practices
- Farmers are not aware of diseases that might affect weaned lambs. To handle such diseases, they seek help from experienced farmers, but they do not rely on science.
- Lack of market information
- Lack of knowledge about breeding practices

Infrastructure:
- Barns are not well constructed due to high construction costs as well as low income
- Traders tend to save money by spending less on construction and renovations so that they could earn more.

Informal rules & norms:
- The belief in the natural milk as the most beneficial to the lambs
- Strong preference for traditional weaning practices

Setting & enforcing:
- Sector-specific regulations & standards
- Non-statutory regulations

Infrastructure:
- Poor infrastructure of barns owned by farmers.
- Places where sheep give birth are not well equipped, nor well prepared for safe delivery; they are not clean, lacking facilitation.
- Farmers do not have the necessary, appropriate tools for reproducing and feeding
- Lack of maintenance service providers for automated lactating

Laws:
- There are no regulations or laws controlling farming, raising, breeding lambs, or animal production in oPt

Government:
- Government role is limited.
- Vaccination schemes are delivered ineffectively
- Insufficient monitoring over imported sheep and limited attempts to regulate imports

Supply (Livestock Farmers)

Demand (Traders)
Pathways to Increased Growth and Competitiveness

Drivers of Demand
The main driver of demand for meat will continue to be a high population growth rate of 3% per annum. Given the OPT’s current population of 4.68 million, average consumption of red meat at 2.5 kg per capita, and average fresh meat yield for a lamb being 20 kg, the expected number of lambs required for consumer consumption next year will be 515,000. In addition to this, an estimated 200,000 male and female lambs will be required to maintain the flock. Of this, Gaza’s, requirement will be an estimated 185,400 lambs (at a current population of 1,800,000 and the average sheep net yield of 25 kg).

A strong local preference for lamb meat means that demand is highly responsive to prices, and therefore a decrease in prices would lead to a direct increase in consumption. Herders are in a position to take advantage of this situation if they can increase output, reduce costs, and pass a portion of resulting higher margins to end consumers. Increasing competitiveness is also a compulsion of the shrinking availability of grazing land.

These facts underscore the need to reduce the price of lamb meat in OPT, which at current levels is out of the range of average consumers. Even on occasions of traditionally high demand for lamb meat, such as holidays and special occasions, lamb meat is becoming less popular. It is conceivable that if the situation does not change, consumption will continue to shift to alternate meats, and imports of sheep meat will increase. A reduction in price will lead to an increase in demand, and if managed properly, traders and farmers will be able to benefit from higher profit margins. To illustrate the impact of this, during the study, industry experts informed PMPD that a reduction in sheep meat price from 6 to 4.5 JD/kg would increase demand by 150%. Alternatively, an increase from 6 to 7.5 JD, would cause demand to fall by 70-80%. While these figures may be high, they underscore the fact that demand varies closely with price.

Enhancing Competitiveness
With about 75% of herders belonging to the small-scale and medium-scale producer category, much of the production is tied to actors operating at low-levels of competitiveness. This is both a challenge and a significant upgrading opportunity. Validation workshops conducted by PMDP (27th and 29th October, 2015) confirm that flock management and improved weaning practices have a significant role to play if the sub-sector’s competitiveness is to be improved. Several concrete options are available for increasing the competitiveness for sheep production, most of which involve a combination of enhancing farmer practices, and upgrading equipment.

Improve Farmer Practices
Improving on-farm management of sheep production and the weaning process is a key area which requires to be addressed. Farmers can achieve significant increases in productivity, just by

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15 PMDP estimates (conservative).
tweaking their operational model. Several areas require practice upgrading, including breeding, housing, weaning, feeding, business management, and animal health management.

**Breed Management**

Farmers can increase meat and milk yields by investing in higher-yield breeds and better breed management. One route to consider (though more applicable for slightly larger herders) would be to specialize in either meat or milk production. For example, one of the sheep varieties that has become more popular in Israel is Dorper sheep. This variety is known for its higher lambing rate and meat yield. Other avenues for increasing productivity include utilizing artificial insemination, improving gestation period practices (housing, ewe care, etc), and more careful selection of parent stock. However, such upgrades require careful technical management.

**Animal Housing**

Currently, farmers often do not provide suitable housing for new-born lambs. Small improvements could result in tangible benefits, especially in the reduction of mortality rates. These should include investing in special incubators for new born lambs, temperature control inside sheds, and maintenance of hygienic conditions.

**Switch from Natural Lactation to Alternative Lactation**

Transitioning to alternative lactation could increase yields and farmer incomes, and reduce the incidence of disease. PMDP’s comparative analysis of production shows that not only an estimated saving of NIS 130 per weaned lamb (aged 2-3 months) could be realized by switching to alternative lactation, but the time required to produce a grown weaned lamb would reduce to about 30 days. Alternative lactation would also reduce the risk of disease transfer.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Region</th>
<th>Natural Lactation</th>
<th>Alternative Lactation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration of Weaning Period</strong></td>
<td>West Bank</td>
<td>55-65 days</td>
<td>30-40 days</td>
</tr>
<tr>
<td></td>
<td>Gaza</td>
<td>90-100 days</td>
<td></td>
</tr>
<tr>
<td><strong>Lactation Cost</strong></td>
<td>West Bank</td>
<td>NIS 300</td>
<td>NIS 170</td>
</tr>
<tr>
<td></td>
<td>Gaza</td>
<td>NIS 225</td>
<td>NIS 128</td>
</tr>
<tr>
<td><strong>Impact</strong></td>
<td>oPt</td>
<td>Higher milk cost</td>
<td>Higher margin on lambs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loss of potential income from dairy and derivatives</td>
<td>Additional income from dairy and dairy derivatives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increased disease risk</td>
<td>Reduced disease risk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mortality: 10-30%</td>
<td>Up to 50% reduction in mortality</td>
</tr>
</tbody>
</table>

For greater number of farmers to convert to alternative lactation models (which can be calibrated depending upon farmer size and available investment), however, would require both a significant

---

16 Savings for Gaza would be somewhat lower, at NIS 77/weaned lamb.
increase in farmer knowledge (leading to behavioural change), and increased availability of alternative milk and lactation equipment in the market. Enhancing farmer knowledge and encouraging a shift in behavior is likely more challenging of the three, as farmer interviews indicate a reluctance to adopt alternative lactation (particularly in Gaza). The main reasons for this are that farmers do not consider natural lactation to have a financial cost, and have fairly limited awareness of the process, practices, and equipment required for alternative lactation. However, the market opportunity being created by the rising demand for milk and dairy products may create an impetus for change. Raising awareness about the financial benefits of alternative lactation may also encourage medium and larger-scale farmers in particular, to make the shift.

A few agro-input dealers in the country already trade in alternative milk and the supply of lactation equipment. The supply of these could conceivably be increased, if there was greater demand from farmers. However, there would be challenges, such as availability in more remote areas, and the business feasibility of selling appropriate forms of equipment to smaller farmers, which would have to be overcome.

Feeding

For weaning to be done successfully, alterations in feeding practice will also be required to complement the process. Currently, most farmers feed newborn lambs in a haphazard manner, letting them feed alongside ewes. However, newborn lambs should be fed separately, and administered a special high-protein concentrated feed diet. The feed required is available in local markets, though it is imported.17

Business management

Changes required in business management practices vary with the type of farmer model under consideration. The majority of small-scale herders in the country are not organized (in cooperatives or other types of associations), and are therefore unable to take advantages of aggregation and collective bargaining power. Anecdotal evidence indicates that this makes it easy for traders to extract lower prices from small farmers. Remediying this would likely lead to higher margins through bargaining.

There is also a need to improve retail market knowledge amongst small farmers/herders and calibrating production accordingly. i.e. having better information about end market prices and peaks in demand (due to special occasions), so as to take advantage of higher prices in the demand cycle.

In support of the above, improving record keeping practices will also be required. As a significant percentage of livestock farmers are in fact literate, there is a good opportunity for doing so.

Animal Health Management

17 For a more detailed discussion of the dynamics of the feed market, see “Market System Analysis of Concentrated Animal Feed, PMDP 2015.”
Enhance On-farm Health Management

The incidence of disease can be reduced significantly just by better animal care on the part of farmers. This includes:

- Regular cleaning of areas where sheep are housed
- Maintenance of housing and equipment
- Checking animal health regularly, and having higher proficiency in disease detection
- Administering appropriate vaccines according to schedule

Upgrade Veterinary Services

While the market system for veterinary services requires further assessment, discussions with farmers have elucidated gaps in the provision of this supporting service.

There is a need to enhance and specialize veterinary skills in both the public and the private sector. Anecdotal evidence indicates that most vets in the oPt are not specialized (e.g. small ruminants versus cows versus poultry), which reduces the efficacy of their services.

Farmers also complain that vets are expensive, and many are not adequately trained. It has also been observed that the lack of industry standards and monitoring facilitates malpractice – many vets have made a business out of selling medicine, rather than providing high quality animal care.

Farmers (particularly small-scale) are at the mercy of such actors. High mortality rates amongst sheep indicate that veterinary services in oPt currently do not work well. A well-designed plan to upgrade competitiveness will require further “diagnosis” of this market system. There is limited published knowledge of veterinary service from a market-led lens. However, significant institutional knowledge is available within the country, which can be tapped to develop a more thorough picture as a starting point.

Engage the Public Sector to play a more Effective Support Role

While this is a challenging operational space for a market-development programme, improvements in public sector service delivery will have a significant positive impact on the sub-sector. Within the government, the Ministry of Agriculture might be able to play a more effective role by focusing its limited resources on a more innovative operational model.

- Endorsing private provision of veterinary services, and reallocating resources to certification, regulation, quality control, and training support.
- Working with research institutes to identify and transplant innovative practices and technology (e.g. in sheep breeds, lactation equipment, etc.). This could be done, for example, by liaising with regional or international agricultural authorities to conduct learning tours.
- Launching public-private partnerships to support upgrading of practices and technology in the sub-sector.
- Delivering effective regulation and control of input supplies – medicine, feed, imported lambs, etc.
Potential Interventions

**Improve the technical and managerial skills and practices of farmers**

- Enhancing animal health care practices.
- Provision of adequate animal housing and environment.
- Improving linkages with vets, and enhance ability to detect and prevent disease.
- Administering vaccinations according to schedule, not buying medicines without vets consulting.
- Utilization of improved breeding (sheep strains) and lactation practices.
- Improve breeding, housing, and business management practices amongst farmers.
- Enhance farmers’ knowledge about feeding practices and introduce them to benefits of using alternative milk.
- Encourage women to engage in production and sale of milk and dairy derivatives.

**Improvements in Supporting Functions**

- Facilitate better relationships between farmers and alternative milk distributors, for enhanced coordination and exchange of technical information about milk use
- Encourage traders to invest in better transportation and handling for animals.
- Facilitate knowledge transfer between successful traders/fatteners and lower performing farmers.
- Explore mechanisms to assist farmers to upgrade equipment
- Explore models for delivering cost-effective private veterinary services to small and medium-sized farmers currently outside the veterinary system

**Facilitate synergy between supply and demand of weaned lambs**

- There is a need for better record keeping by farmers and traders, and to generate feedback from this to improve production and transaction planning.
- Encourage contract-based transactions between farmers and customers
- Facilitating information flow (regarding prices, production technology, etc) between farmers and traders

**Modifications in the Enabling Environment**

- There is a need for improving regulation of imports and issuance of farming licenses.
- Institution of product quality control and hygiene standards.
- Support private sector participation in the provision of extension services
- Public sector support for research at universities and institutes.
- Development and dissemination of industry standards for lamb-rearing.
Annexes
Annex 1: Study Methodology

The research for this study was conducted using a mixed methods approach comprised of desk research; field research, including in-depth interviews with key informants, key actors and experts and relevant stakeholders; and two validation workshops to further discuss the results with groups of livestock farmers and traders.

**Desk Research**

The process started with a comprehensive review of the relevant documents including reports and studies in similar fields on the national, regional and international levels. This helped put the major achievements of these studies into consideration when issuing this study to be a value adding and a complementary one.

**Field Research**

A number of interviews and focus group discussions were conducted with samples of livestock farmers and traders (Weaned Lambs Suppliers) in different governorates of the OPT. In addition key personnel in the Ministry of Agriculture and experts in the field were interviewed.

Interviews and Focus Group Discussions (FGDs) were conducted using the research tools adapted to the requirement of the research objectives and to the weaned lambs sector, based on the outlines given in the terms of reference. On-site observations took place also through visiting a number of livestock farms in the Gaza Strip.

**In-depth Analysis**

Information gathered through reviewing the relevant researches and studies, conducting interviews with farmers and traders, Input suppliers, cooperatives, local and international organizations, key informant interviews and observations made during the field research was analyzed in detail. The analysis adopted the M4P approach through the following:

- Identify the system-level constraints (root causes) that the programme can feasibly address
- Familiarise programmes with the incentives and capacities of market players associated with these constraints
- Generate intelligence and insights which can be used to influence market players during intervention
- Provide information that can be used for measurement purposes

**Validation Workshops**

Finally two validation workshops were facilitated and conducted by the study team with key representatives of many stakeholders included farmers and traders, Agricultural cooperatives, MoA, PSI, PARC, UAWC, FAO, ACF, Care International. This was to further investigate the quantitative and qualitative results and discuss any challenges facing the famers and weaned lambs suppliers and their needs and future potentials as well.
Annex 2: Impact Framework
Farmers adopt better breeding practices

- Improve husbandry skills of livestock farmers before lambing
  - R&D on the best breeding practices adopted by farmers.
  - Improve farmer practices in housing, feeding, and animal healthcare
  - Pilot private-led models of vet service delivery

Lambing rates improve

- Farmers increase production of lambs

Farmer incomes increase

- Farmers increase production of lambs
- Farmer sales & gross margins increase

Mortality rates decrease

- Weaning results in higher yield over shorter duration

Weaning results in higher yield over shorter duration

- New sheep strains introduced in the local market

Public sector improves quality control and service provision

- Livestock sector is better governed

Farmer sales & gross margins increase

- Strengthen the enabling environment
  - Reduce VAT on livestock inputs
  - Issuing particular specifications of lambs, related products and automatic feeding/lactating mechanism
  - Preventing any illegal selling or importing
  - Developing the governmental role in monitoring veterinary services
  - Work with the Veterinarians’ Syndicate to upgrade service quality and human capital standards.
  - Structure public-private partnerships to deliver veterinary services.

New sheep strains introduced in the local market

- Improve quality of available strains
  - R&D on the best strains of sheep
  - Developing the management skills of farmers to improving the sheep strains and so increasing the production in terms of lambing/year and twins rate
  - Supporting the establishment of sheep mothers’ farms with high specifications

Farmers improve weaning practices

- Improve practices of lambs’ breeders/farmers and enhance their infrastructure during the weaning period
  - Supporting the farmers technically on how to feed their lambs and benefits of using alternative milk
  - Improve hygiene and safety measures at barns
  - Establishing a bank for colostrum to support farmers increasing the immunity of new born lambs
  - Empowering women to have more effective and leading role during the weaning process

Improve practices of lambs’ breeders/farmers and enhance their infrastructure during the weaning period

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### Annex 3: Donor Programmes Supporting the Livestock Sub-Sector

<table>
<thead>
<tr>
<th>#</th>
<th>Project</th>
<th>Objective</th>
<th>Activities</th>
<th>Budget</th>
<th>Start date (M/Y)</th>
<th>End date (M/Y)</th>
<th>Donor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Empowerment of Economically Productive Families Project, implemented by the Agriculture Development Association (PARC), the Islamic Relief and the Union of Agricultural Work Committees</td>
<td>Support the affected livestock farmers by the 2008 war on Gaza.</td>
<td>Distribution of goats and cows for affected families, in addition to fodder (an average of 116 tons for each CBO)</td>
<td></td>
<td>June, 2015</td>
<td>January, 2016</td>
<td>EU</td>
</tr>
<tr>
<td>3</td>
<td>A project implemented by the Welfare Association in Juhr Al Deik Area</td>
<td>Support livestock farmers with goats.</td>
<td>Distribution of goats (10 goats for each beneficiary) for a total of 130 beneficiaries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>A project implemented by the Welfare Association (Ongoing)</td>
<td>Support the livestock farmers with goats.</td>
<td>Distribution of goats for a total of 230 beneficiaries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Emergency support to protect the marginalized goats’ farmers, implemented by the Union of Agricultural Work Committees</td>
<td>Support the livestock farmers and increase their production in this sector.</td>
<td>Distribution of fodder, provision of veterinary services, counselling and guiding for breeders</td>
<td>EUR 66550</td>
<td>April, 2013</td>
<td>December, 2013</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Supporting sheep breeders, implemented by the Union of Agricultural Work Committees</td>
<td></td>
<td>Distribution of sheep, cows and fodder</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Promoting the community resilience Project, implemented by the Union of Agricultural Work Committees</td>
<td></td>
<td>Distribution of 210 sheep and 7 tons of fodder</td>
<td></td>
<td>January, 2013</td>
<td>June, 2014</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Emergency Response Project in Gaza Strip, implemented by the Agriculture Development Association (PARC)</td>
<td>Recover livelihood of 16 families.</td>
<td>Distribution of sheep production units (Assaf) for 16 families</td>
<td>$16000</td>
<td>December, 2014</td>
<td>July, 2014</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Partnership project for developing the community capacity to handle risks and recover livelihood in the West Bank and Gaza Strip, implemented by the PARC.</td>
<td>Developing the community capacity to respond to disasters and risks</td>
<td>Distribution of 100 sheep (Assaf) with 200 sacks of fodder</td>
<td>April, 2015</td>
<td>October, 2015</td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
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</tr>
<tr>
<td>10</td>
<td>A project implemented by PARC.</td>
<td>Hybridization of Shami sheep</td>
<td>Distribution of 14 sheep of Shami strain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improving the food security and promoting the resilience Project in Gaza Strip through rehabilitation of infrastructure after the war 2014</td>
<td>Promote the resilience of Gaza Strip</td>
<td>Distribution of 10 fattened sheep, fodder, water pond for 30 beneficiaries</td>
<td>December, 2015</td>
<td>March, 2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Improving the livelihood of farmers Project, implemented by MAAN Development Center</td>
<td>Distribution of sheep and fodder</td>
<td>Distribution of 306 sheep for 153 beneficiaries, 150 kg fodder and 30 kg hay</td>
<td>2009</td>
<td>2015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>A project implemented by Qatar Charity Association (Ongoing)</td>
<td></td>
<td>Distribution of sheep</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Enhance resilience and maintain livelihoods of Palestinians food insecure households affected by the conflict, Palestine, implemented by ACF and (PLDC) and 6 Community Based Organizations (selected during PAC 1) in WB and GS</td>
<td>To develop efficient water management systems, reduce water scarcity, increase productivity and competitiveness</td>
<td>EUR 2,643,776</td>
<td>2015</td>
<td>2018</td>
<td>AECID</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Strengthen the resilience in Masafer Yatta and Road 317 clusters implemented by the ACF and Ministry of Agriculture (MoA); (PLDC); Masafer Yatta Cooperative for Animal Husbandry (MYC)</td>
<td>To prevent the deterioration of the living conditions of Palestinian living in Area C.</td>
<td>$ 450,000</td>
<td>Dec, 2014</td>
<td>Aug, 2015</td>
<td>UNDP through CRDP</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Emergency livestock shelter rehabilitation in the West Bank. Implemented by the ACF</td>
<td>To provide animal shelters to small scale herders.</td>
<td>$ 200,000</td>
<td>2014</td>
<td>2015</td>
<td>FAO</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Livelihood support to the most vulnerable communities in the southern West Bank with an emphasis on traditional herders</td>
<td>To increase the viability of herding livelihoods by the reduction of production costs and the valorization of local production.</td>
<td>$160,000</td>
<td>May, 2013</td>
<td>May, 2014</td>
<td>ACCD</td>
<td></td>
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<tr>
<td>18</td>
<td>Emergency support to vulnerable livestock herders in the southern the West Bank. implemented by ACF</td>
<td>To protect degradation or loss of livelihoods of herding families in 8</td>
<td>EUR 2,700,000</td>
<td>May, 2012</td>
<td>May, 2013</td>
<td>ECHO</td>
<td></td>
</tr>
<tr>
<td>Project ID</td>
<td>Title</td>
<td>Description</td>
<td>Locations</td>
<td>Duration</td>
<td>Implementing Partners</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------</td>
<td>----------</td>
<td>-----------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Emergency support to livestock herders in the southern part of the West Bank</td>
<td>The project aim to distribute animal feed for small ruminants in the area east of Yatta in the West Bank.</td>
<td>EUR 71,300</td>
<td>May 2011</td>
<td>Jan 2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Support for the means of sustenance of the most vulnerable communities in the southern part of the West Bank, especially traditional livestock farmers, through components of food safety, water and sanitation implementing partners are ACF (ESDC), (PLDC), (UAWC), (MoA)</td>
<td>The project aims to increase the viability of herding livelihoods by increasing physical and economic access to basic water.</td>
<td>EUR 3,000,000</td>
<td>Aug, 2010</td>
<td>Aug, 2014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Support the Palestinian SPS FAO,MoA</td>
<td>Enhance the SPS Enabling environment in the OPT</td>
<td>1,376,000 Euro</td>
<td>May 2014</td>
<td>May 2017</td>
<td>NRO</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Support sustainable management of common grazing lands, implementing by the MoA</td>
<td>Enhancing the grazing lands availability</td>
<td>$1,300,000</td>
<td>Jan 2009</td>
<td>December 2015</td>
<td>Brazil</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Implementing special protection crops</td>
<td></td>
<td>$46,000</td>
<td>2014</td>
<td>2015</td>
<td>Australian</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Classification of ORF virus for sheep and producing a protocol to help livestock farmers applying vaccination (immunization)</td>
<td></td>
<td>$28,890</td>
<td>2014</td>
<td>2015</td>
<td>FAO</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Using treated waste water to produce fodder crops</td>
<td></td>
<td>$12,000</td>
<td>2014</td>
<td>2015</td>
<td>FAO</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Develop the use of Artificial Insemination</td>
<td></td>
<td>$50,000</td>
<td>2013</td>
<td>2015</td>
<td>ACCAD</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Genetic Mapping for legumes as nutritional ingredient to be used as animal feed</td>
<td></td>
<td>$31,000</td>
<td>2014</td>
<td>2015</td>
<td>FAO</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Applying disease control of small ruminants new born</td>
<td>Arab Economic Development Fund in South Africa</td>
<td>$147,000</td>
<td>2010</td>
<td>2015</td>
<td>Arab Economic Development Fund in South Africa</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Supporting the development of the central veterinary lab</td>
<td>Spanish Cooperation</td>
<td>EUR 962,209</td>
<td>2012</td>
<td>2015</td>
<td>Spanish cooperation</td>
<td></td>
</tr>
</tbody>
</table>
# Annex 4: Production System of Small Ruminant (including lambs)

**Ministry of Agriculture/FAO Livestock Sector Strategy 2015-2019**

<table>
<thead>
<tr>
<th>Type of Production systems</th>
<th>Intensive (Industrial)</th>
<th>Semi-intensive (traditional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small ruminants ownership</td>
<td>Large herder: more than 200 heads</td>
<td>Household level: 1-10 heads Small scale herder: Average 34 heads</td>
</tr>
<tr>
<td>Average age of milking cow</td>
<td>6 years</td>
<td>8-10 Years</td>
</tr>
<tr>
<td>Average milk production/year/head</td>
<td>180 liter per year/head</td>
<td>125-150 liter per year/head 150-18- liter per year /head</td>
</tr>
<tr>
<td>Animal bread</td>
<td>Awassi, Assaf, Mixed Local goat and mix goat</td>
<td>Awassi, Assaf, mixed Local goat and mixed goat</td>
</tr>
<tr>
<td>Market system</td>
<td>Home processing</td>
<td>Home processing</td>
</tr>
<tr>
<td>End product</td>
<td>Goat and sheep milk Goat and sheep meat</td>
<td>Goat and sheep milk Goat and sheep meat</td>
</tr>
<tr>
<td>Weaning Period</td>
<td>2-2.5 months</td>
<td>2-2.5 months</td>
</tr>
<tr>
<td>Fattening period</td>
<td>4 months for lambs 6-10 months for goats</td>
<td>4 months for lambs 6-10 months for goats</td>
</tr>
<tr>
<td>Age of slaughter</td>
<td>At least 6 months for lambs 6-12 months for goats</td>
<td>At least 6 months for lambs 6-12 months for goats</td>
</tr>
<tr>
<td>Weight at slaughter (kg)</td>
<td>60-90kg for lambs 45-60kg for goats</td>
<td>60-90kg for lambs 45-60kg for goats</td>
</tr>
<tr>
<td>Market destination</td>
<td>Local market</td>
<td>Local market</td>
</tr>
<tr>
<td>End product</td>
<td>Goat and sheep milk: Goat and sheep meat:</td>
<td>Goat and sheep milk: Goat and sheep meat:</td>
</tr>
<tr>
<td>Weaning Period</td>
<td>2-2.5 months</td>
<td>2-2.5 months</td>
</tr>
<tr>
<td>Fattening period</td>
<td>4 months for lambs 6-10 months for goats</td>
<td>4 months for lambs 6-10 months for goats</td>
</tr>
<tr>
<td>Age of slaughter</td>
<td>At least 6 months for lambs 6-12 months for goats</td>
<td>At least 6 months for lambs 6-12 months for goats</td>
</tr>
<tr>
<td>Weight at slaughter (kg)</td>
<td>60-90kg for lambs 45-60kg for goats</td>
<td>60-90kg for lambs 45-60kg for goats</td>
</tr>
<tr>
<td>Market destination</td>
<td>Local market</td>
<td>Local market</td>
</tr>
</tbody>
</table>
### Annex 5: Sheep Production Models

<table>
<thead>
<tr>
<th>Small-scale farmers</th>
<th>Medium-scale sheep farmers</th>
<th>Large-scale sheep farmers (traders)</th>
</tr>
</thead>
</table>
| Many small-scale farmers in Gaza are not traditionally livestock farmers. In many cases, they are in the practice of rearing lambs donated as part of livelihoods support programming from donor institutions/organizations. | The second class is the traditional sheep farmers and herders. This group consists of traditional herdsmen. **Characteristics:**  
• Poor but slightly better off than subsistence farmers.  
• Herd varies between 20 to 70 sheep  
• Sheep production is a major source of income.  
• Grazing is popular among this group especially Bedouin. In some areas where pasture land is lacking, they depend more on green fodder including plant residue which can be obtained cheaply.  
• Herd growth is a major objective.  
• Experience as traditional herdsmen improves their productivity and economic efficiency.  
• Depend on own experience for technical information.  
• Cost/unit is lower than the first group due to better technical/business management. | The third group consists of sheep traders rather than farmers. **Characteristics:**  
• Heard is usually larger than 50. Can reach hundreds during marketing season. Size frequently fluctuates due to buying/selling.  
• They are the wealthiest group among the three channels.  
• Priority is trading versus growing the herd naturally.  
• Sheep are not kept for long time and usually fed on fodder. No grazing.  
• Traders usually have good experience about breeding herds and know how to maximize their economic benefits quickly.  
• Cost/unit is relatively low due to economy of scale. |

In the WB, small livestock keepers are farmers by profession, and they normally practice mixed (agricultural and livestock) farming.

**Characteristics:**  
• Poor families facing economic hardship.  
• Size of herd can vary from 2 to 20.  
• Rarely graze their sheep as they keep them in the farm and provide them with fodder/green fodder.  
• Low knowledge/experience in animal production and health.  
• Dependent on non-reliable sources of technical information on sheep production.  
• Sheep production often isn't their primary activity.  
• Often sell part of the herd without considering things from a business standpoint.  
• Normally high cost/unit due to small production size and lack of efficient practices. |